REMARKS/ARGUMENTS

This is a response to the Final Office Action mailed October 20, 2006

In that Office Action, the Examiner has rejected claims 1, 2, 3, 7, 8, 9, 10, 13 and 14 under 35 U.S.C. §102(b) as being anticipated by Makaran U.S. Patent No. 6,630,805.

The Examiner further rejects claims 4 and 11 as being unpatentable over Makaran in view of Archer U.S. Patent No. 4,365,171.

The Examiner further rejects claims 5, 6 and 12 under 35 U.S.C. §103 as being unpatentable over Makaran in view of Archer and Heminger et al. U.S. Patent No. 5,751,052.

The Examiner rejects claims 8 and 14 under 35 U.S.C. §103 as being unpatentable over Makaran in view of Archer and Turvey et al. U.S. Patent No. 6,759,835.

Applicant respectfully requests reconsideration of the Examiner's rejection of the claims. Applicant notes that the present application relates to an overcurrent protection circuit for a power switching transistor wherein the power switching transistor has a control electrode and two main electrodes. With reference to Fig. 3, the power switching transistor is shown by the MOSFET Q1.

The circuit of the invention comprises a sensing circuit and includes a protection switch Q4 for sensing the rate of change of voltage with respect to time at one of the main electrodes of the power switching transistor Q1 and for controlling the protection switch Q4 to remove a control signal to the control electrode of the power switching transistor to turn off the power switching transistor if the rate of change exceeds a first predefined value.

According to the embodiment of claim 2, the sensing circuit includes a capacitor C8 coupled to a main electrode of the power switching transistor Q1 and a resistor R8 coupled to receive a pulse of current from the capacitor such that a voltage developed across the resistor turns on the protection switch if the voltage across the resistor exceeds a second predefined value.

Applicant notes that the claims require a protection switch that removes a control signal to the control electrode of the power switching transistor. When Q4 is turned on, it couples the control electrode of Q1 to approximately ground, thereby removing the control signal to the control electrode of the power switching Q1.

The Examiner has cited the Makaran reference U.S. Patent No. 6,630,805 as the primary reference. However, Applicant respectfully submits that this reference does not show the claimed protection circuit including a protection switch that removes a control signal from the control electrode of the power switching transistor.

The Makaran circuit is for a snubber circuit, that is, a circuit that reduces transients due to the commutation of a motor. The motor coil is represented by the inductor L in Figs. 1, 2 and 3, and is modeled in Fig. 4 as a resistor R1, inductor L1 and a back EMF source E. The switch S1 comprises the motor phase switch which provides power to the motor coil. See column 3, lines 18-25 and column 3, lines 37-38. Thus, switch S1 is a switch which commutates the motor. The snubber switch comprises the switch S2 and includes the inductor L2 and the capacitor C. The diode D1 connects the snubber circuit to the commutation switch S1.

In Fig. 29, the snubber circuit is shown at 69 and includes the inductor L, the MOSFET 54 (which is the switch S2 in Fig. 4) and the capacitor 56 (which is the capacitor C of Fig. 4). The various motor phase coils are connected via diodes (which are not identified with a reference numeral) are shown connected to the snubber circuit at the node between the MOSFET 54 and the capacitor C. The diode D1 in Fig. 4 is one of these diodes connected to the phase coils.

A very significant difference between the circuit of Makaran and the present invention is that Makaran is provided to reduce transients due to the commutation of the motor, i.e., due to the switching of the switch S1 of Fig. 4 (which is not shown in Fig. 29, but would be connected to each of the diodes connected to the snubber circuit 69). Figs. 7-10 of Makaran show the snubber circuit in different stages of operation depending on whether the motor phase switch S1 is on or off. For example, Fig. 7 shows the commutation switch on and the current I1 flowing in the direction shown. Then the switch S1 goes off and current flows through the diode D1 into the capacitor C. See Fig. 8. Then, the snubber switch S2 is turned on, as shown in Fig. 9 and current flows from the capacitor into the inductor L2. Following this, as shown in Fig. 10, the snubber switch is turned off and current flows through the diode D1 into the capacitor.

The snubber capacitor C absorbs the inductive energy when the commutation switch S1 turns off and releases it through the snubber switch S2 as shown in Fig. 9. The circuit snubs transients due to the switching of switch S1 and it does protect the switch S1. However, it is not

a protection circuit as claimed wherein a sensing circuit controls the protection switch "to remove a control signal to the control electrode of the power switching transistor to turn off the power switching transistor." In the circuit of Fig. 4, and as shown in Fig. 29, the switch S2 or 54, is not controlled to remove a control signal to the control electrode of the power switching transistor. In particular, the power switching transistor, which is S1 and which is not shown in Fig. 29, would be controlled by a separate motor control circuit which controls the commutation of the phases of the motor. The switch 54 of Fig. 29 or S2 of Fig. 4 does not remove any control signal to the control electrode of the commutation switch. The gate of the switch S1 is controlled by the motor controller (which is not shown), not by the snubber circuit. The reference circuit operates to protect the switch S1 by snubbing out the commutation transients, and not by controlling the gate signal to the power transistor S1. It works in a fundamentally different way than the inventive circuit described and in a fundamentally different way than the inventive circuit claimed.

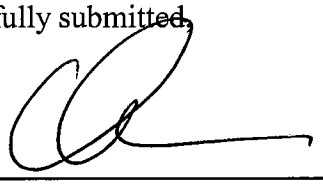
Accordingly, it is submitted that because the Makaran reference does not teach or suggest providing a protection switch "to remove a control signal to the control electrode of the power switching transistor to turn off the power switching transistor," it does not teach or suggest the present invention.

Furthermore, the other references cited by the Examiner with respect to the dependent claims, Archer, Heminger et al. and Turvey et al. do not supply the teaching missing in the Makaran reference and accordingly, even in combination, do not teach or suggest the present invention.

Applicant respectfully requests reconsideration of the Examiner's rejection and offers, if the Examiner believes it will be helpful, to discuss this case with the Examiner by telephone.

In view of the above, Applicant submits that all claims in this application are in condition for allowance, prompt notification of which is requested.

Respectfully submitted,



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